

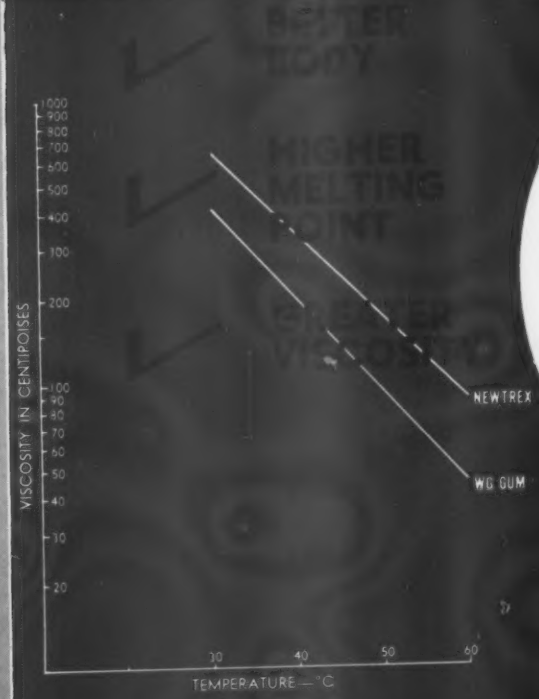
# PAINT and VARNISH PRODUCTION

Established 1911

THE TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT,  
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# PAINT and varnish PRODUCTION

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## NEXT ISSUE

A very informative article entitled "Tetrachlorophthalic Anhydride in Alkyds and Plasticizers" by D. J. Mehta and H. F. Payne of Polytechnic Institute of Brooklyn will appear in the January issue. This article describes experiments with tetrachlorophthalic anhydride as the dibasic acid in oil modified alkyds, and in dibutyl-2-ethyl hexyl esters. Evaluation of this material in linseed modified alkyds for white baking enamels are discussed in detail. Some interesting data on the use of tetrachlorophthalic anhydride as plasticizers in nitrocellulose and vinyl-chloride-acetate copolymers are also presented.

In view of the recent war and the present changing political situation in China, our paint industry will be faced with a shortage of drying oils, and as a result are compelled to utilize fully drying oils originating in this country. A timely article by H. L. Rice on this subject has been scheduled in the next issue. Mr. Rice discusses the use of functional polyols with non-drying and semi-drying oils for the purpose of enhancing the drying and mechanical properties of these soft oils, and thereby make them useful in the formulation of paint vehicles.

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# Editorial

## Comment

### Service Means Sales

AT THE RECENT Paint Convention in Atlantic City, Mr. A. W. Steudel, president of the Sherwin-Williams Co., gave an optimistic view about the business outlook for the paint industry. He said that there is not, nor has been any slowing down of paint purchases by home owners.

Although consumer requirements for some lines of merchandise have been pretty well satisfied, consumer paint requirements are far from satisfied, and are expanding in direct proportion to the kind of job that the paint industry does in advertising and selling. He also stated that there will never be any lack of surfaces that need painting for protection or painting for decoration. He also pointed out that dealer inventories have been pretty well completed, and prices of trade sales have been adjusted. In view of these facts, there is reason to believe that sales volume will be maintained and will improve.

This is very encouraging for the industry as a whole, but to reap all the benefits of this market, it will be necessary for the paint manufacturer, not only to produce paints in good supply, but also to provide paints which meet the consumers' requirements. Variety in color, fast-drying, ease in application, freedom from objectionable odors, durability—these are the features which the consumer will demand of paints. In addition, paint firms must be able to recommend and specify the type of paint best suited for its particular use. They must also be prepared to

furnish information on proper surface preparation and application methods in order to insure optimum coating performance.

The companies that best meet such requirements will show marked sales volume during the coming year.

### Glycerin and Phthalic

DESPITE increased imports of foreign glycerin during the last quarter of this year and the increase in domestic production of synthetic glycerin, the glycerin market has remained firm. It is expected that current glycerin prices will remain at this level during the first half of next year, and in view of the drop in soap production, we can expect a rather tight situation regarding this important raw material.

On the other hand, the production of phthalic anhydride during 1949 has been good, and no serious shortage of this material is expected if present facilities operate at present capacities.

Needless to say, the paint industry is consuming more and more alkyds, and recent changes in formulation have necessitated the use of alkyd-type resins. Not long ago alkyds were used only for industrial purposes. Now half of the industry's alkyd resin production goes into the manufacture of architectural paints, and uses in this field are still increasing. Floor, porch and deck enamels contain long pentaerythritol alkyds with a small percentage of China wood oil varnish. In addition, alkyd enamels used for architectural purposes show better color retention and exterior durability than varnish type enamels.

Also, there are the styrenated alkyds, which were introduced to the industry a year ago. They are finding an important place in the formulator's notebook. In many cases, they are replacing lacquers because of better gloss, durability, and fast-drying characteristics.

There is no doubt that to-day's trend is toward the use of alkyds in one form or another. In view of this situation, glycerin and phthalic anhydride supplies are being constantly checked by the resin manufacturers, since a shortage of one or the other would have a profound effect on the supply of alkyds which to-day's paint industry is greatly dependent upon.

# Cold-Hardening Phenol Aldehyde Resins

**P**RODUCTION of hardening phenol-aldehyde resins is carried out with the aid of alkaline and also acid catalysts. For some time now cold-hardening phenol-aldehyde resins have been known, which are hardened by means of mineral acids, acid salts, acid chlorides, aromatic sulfonic acids and sulfochlorides, as well as by means of derivatives of the sulfonic acids of aralkyl chlorides. The addition of the hardening agents which is required prior to use of the lacquers is found to have a great disadvantage in that such catalyzed solutions show stability only for 4-5 days. The gelatination which occurs subsequently makes further processing of the lacquer impossible. Attempts have been made to overcome this difficulty by condensation with other resins. However, the properties of the original, hardening phenolic resin are necessarily altered as a result.

## Dimesylimide

**I**T has not been discovered that it is possible to eliminate these disadvantages and to produce cold-hardening phenolic resin lacquers of greatly increased stability, which can be applied after adding a catalyst, if dimethane sulfonylimide or, in short, dimesylimide is used as hardening agent. The stability of the lacquers mixed with the agent can be increased to 3-11 weeks, depending on the amount of dimesylimide used in

proportion to the amount of phenolic resin involved. With a dose of 10% of dimesylimide, which has been found to be the most favorable, the phenol-aldehyde resin lacquers can be brushed without difficulty even after 15 days, whereas a comparable lacquer containing an equal proportion of acid chloride as hardening agent becomes useless during the 4th day as a result of gelatination. This is all the more surprising since there is a fairly strong acid present in dimesylimide, a 10% aqueous solution of which has a pH-value of 1.27 thus being more strongly acid than acetic acid. The stabilizing effect of dimesylimide remains even when it is mixed with other hardening agents. Whereas, for example, an addition of 4% of any acid chloride leads to gelling of the phenolic resin lacquer during the 6th day, a solution of the same phenolic resin, to which 10% of dimesylimide and 4% of the identical acid chloride have been added, becomes too thick to be capable of further processing only after the 21st day.

Once the phenolic resin lacquer mixed with dimesylimide has been applied, it hardens within a few hours to such an extent that it is free of tackiness. A coating with 10 or 12% of dimesylimide which has dried for 24 hours at room temperature is hard and can scarcely be scratched with a finger nail. Thus, it does not differ in this respect from a film of the same phenolic resin to which an equal proportion of an acid chloride or sulfonic acid chloride has been added as hardening agent.

Whereas the known hardening

agents, particularly the acid chlorides, are characterized by a peculiar, unpleasant odor which irritates the mucous membranes, the dimesylimide is an odorless, solid substance with a melting point of 154° C. It is readily soluble in all solvents ordinarily used for phenolic resin lacquers.

As far as the effects of dimesylimide on the properties of the phenolic resin coatings are concerned, it has been found that the lightfastness is decidedly better than it is when acid chlorides are utilized. Whereas in the latter case a transparent coat on beechwood turns dark-brown in a fade-ometer after 200 hours of exposure, the coats prepared with the aid of dimesylimide do not become discolored.

An artificial aging at 50° also reveals that the coatings produced with dimesylimide are less discolored and considerably stronger than the corresponding coatings containing acid chlorides.

## Examples

### Example No. 1

One hundred parts of a 50% phenol-formaldehyde resin, marketed under the registered trade-name of "Luphen H", are mixed with a solution of 5 g of dimesylimide in 25 cc of ethyl alcohol. This immediately produces a very intense dark red coloring. The solution is stable for 14 days and may be coated on wood or other bases during this time. If necessary, about 50% of an iron oxide pigment may be admixed to the lacquer.

(Turn to Page 17)

*This is one of the series of German technical papers translated by Research Information Service, 509 Fifth Ave., New York 17, N. Y.*



# EMULSION PAINT THEORY

This paper was presented by the New York Paint and Varnish Production Club, Technical Committee #44, Henry F. Payne, chairman, at the N. Y. Paint and Varnish Club on Nov. 10, 1949 for publication in the Official Digest of the Federation of Paint and Varnish Production Clubs and is published with their permission.

RECENT years have shown that emulsion paints have become an increasingly important factor in the surface coating industry. It is the purpose of the present paper to review the historical background, development and present status of emulsion paints and to indicate possible future trends. Emulsion paints in the broad sense are pigmented emulsions, the vehicle may consist of oils, resins, nitrocellulose or other organic binders which have been emulsified in an aqueous phase. This wide range of pigmented emulsions may be divided in two sections, those used for architectural applications and those used for industrial purposes. This discussion will be restricted to those emulsion paints which are used principally for interior and exterior architectural application. These emulsion paints are of the "oil-in-water" type and may, therefore, be thinned with water to application consistency. However, they should not be confused with water paints which are pigmented solutions of glue, casein or other water soluble binders. Emulsion paints are the result of attempts to improve the film properties of water paints by the addition of oils, resins, etc., but the best performance is obtained from emulsion paints made with organic vehicles especially designed for this purpose.

The requirements for architectural emulsion paints vary greatly and include low cost interior paints used for decorative purposes chiefly, high grade interior paints used for dairies, bakeries and general plant maintenance and exterior paints for specific structures. Consequently, a wide variety of materials have been used to meet these various demands and new types are under development. In common with the regular oil or resinous paints, emulsion paints have cer-

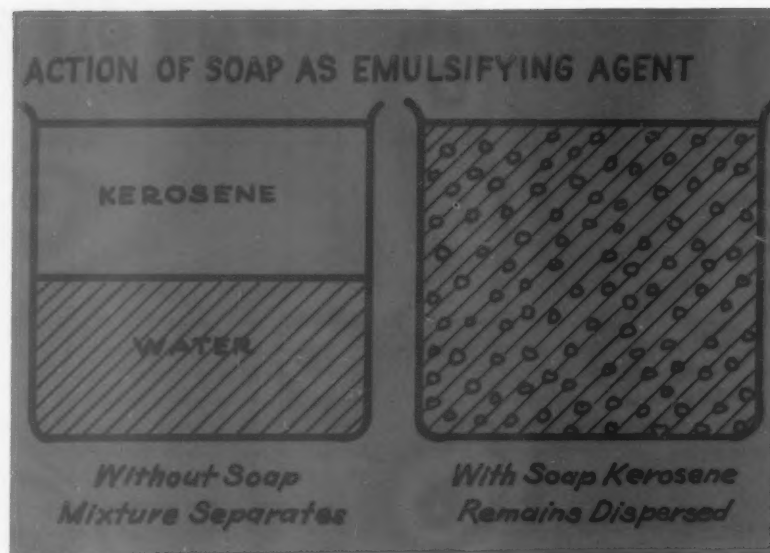


Figure 1

tain limitations in formulation which are dependent on the oils or resins used, the type of emulsifying and stabilizing agents and other factors. However, an indication of the growing importance of emulsion paints may be obtained from data released by the Bureau of the Census, May 24, 1948 which shows a total value of \$28,170,535 for resin emulsion paints produced in 1947. The economic and the performance characteristics of emulsion paints have contributed greatly to this phenomenal growth.

## Historical Background

THE historical background of emulsion paints can hardly be considered without including water paints. Radcliffe gives an excellent survey of this field with particular respect to casein paints. He refers to U. S. Pat. 50,068 issued in 1865 which discloses the use of milk, resin and linseed oil with several pigments. The development of this type paint is covered thoroughly up to the important patents of Regnier, U. S. Pat. 1,506,081 (1924), Atwood, U. S. Pat. 1,893,608 (1933) and Iddings, U. S. Pat. 2,047,143 (1936) and 2,090,630 (1937) which disclose the

use of sodium fluoride for making neutral solutions of casein. A material closely related to casein is alpha protein and O'Brien (34) states that it was first produced in 1935. Alpha protein is made from the soy bean by a solvent extraction process but another type, gamma protein, is made by a mechanical process. The use of these materials in water and emulsion paints is covered in detail in (4), (5), (23) and (34).

Another type of water paint, often referred to as calcimine, is made with glue as the binder and such pigments as whiting and clay. This is an improvement over simple white wash made with slaked lime and water because it does not rub off so easily, but the relatively poor wash resistance of its films limits its applications. The casein water paints are better than calcimine for wash resistance but are not so good as oleo-resinous paints. The attempts made to improve wash resistance by adding resins and oils to casein paints showed that the casein paint was a good emulsifier. Then followed a period in which such mixtures were used, with the casein constituting the major film forming component. An



# Formulation, Manufacture and Use

arbitrary distinction between casein paints and emulsion paints containing casein would be that the former use casein as the major film binder and the latter use casein simply as the emulsifying agent or stabilizer. There are, of course, many emulsifying agents available so that emulsion paints can be made which are entirely free of casein. However, many of the formulations suggested in the literature contain at least 25% casein in the binder and this is certainly more than is required for emulsification and stabilization. A moderate proportion of casein does not lower the scrub resistance seriously and it improves application properties.

In view of the gradual transition from fortified casein paints to straight oleoresinous emulsion paints it will be apparent that no definite date can be given for their introduction to the paint industry. However, alkyd resin emulsion paints were developed in Germany and patent applied for in 1928. The same composition was applied for in the United States in 1929 by Friedrich Frick (21) and another in 1930. These are broad patents showing the use of alkyd resins in

emulsion paints. These are the typical oil-in-water type emulsions but another patent, U. S. Pat. 2,220,685 issued to Myers & Cheetham (31) in 1940 describes the water-in-oil type which may be reverted as desired. In recent years the trade literature has been replete with descriptions and formulations for emulsion paints made with a very wide variety of materials. It is of interest to note U. S. Pat. 2,373,577 issued to Eugen Hirsch (25) in 1945 describing the manufacture of gloss emulsion paints as an example of the diversity which may be found. An excellent article by Sutheim (38) on the general principles of formulation and application of emulsion paints contains a very good bibliography on the subject. The types of materials used in emulsion paints will be discussed in the section on emulsion paint development.

## General Theory

THE theory of emulsification involves a great deal of physical chemistry, and is highly complicated because of the wide variety of emul-

sions in use at the present time. It is the purpose of the present paper to simplify the theory as much as possible.

An emulsion is a stable dispersion of two immiscible liquids. When the dispersed phase is an oil, wax, resin, etc. and the continuous phase is essentially water, the emulsion is referred to as the oil-in-water type (O/W). Conversely, when the dispersed phase is water and the continuous phase is oil, resin or similar materials, it is referred to as the water-in-oil type (W/O). Milk is an O/W emulsion because the butter fat is finely dispersed in a watery medium. Butter is a W/O emulsion because it consists of a small amount of water finely dispersed in butter fat. In general, the phase constituting the larger proportion is the continuous phase. It is possible to determine the type of emulsion by attempting to dilute first with water and then with oil. O/W emulsions may be thinned with water but W/O emulsions require an oil or non-polar solvent.

Two immiscible liquids may be dispersed or emulsified by sufficient

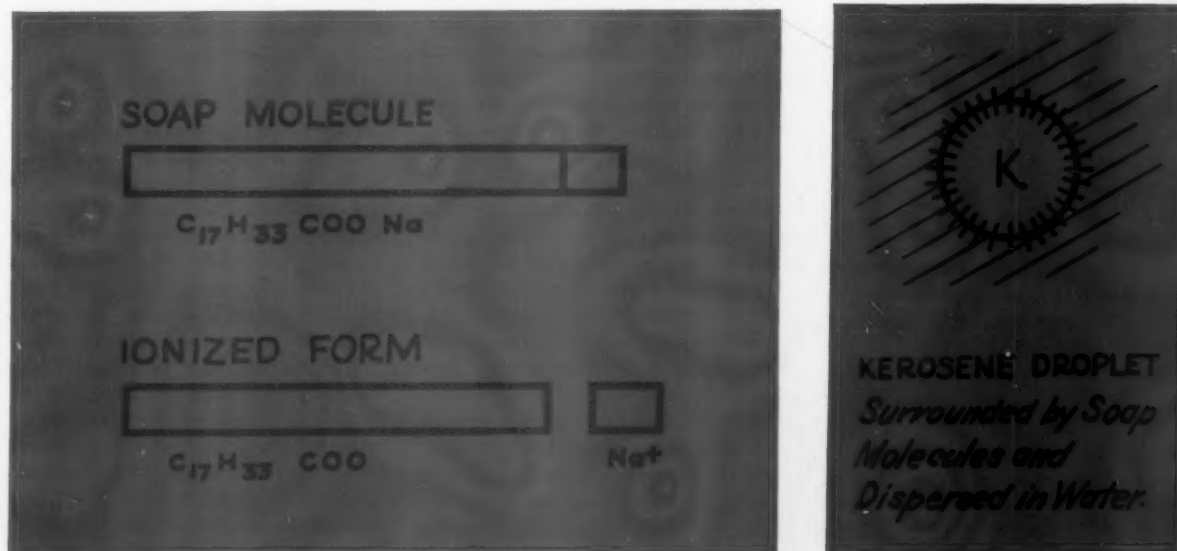


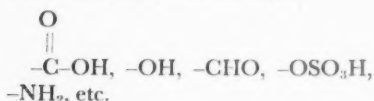
Figure 2

agitation but they tend to separate almost immediately after agitation stops. Such unstable emulsions may be stabilized by addition of emulsifying agents and stabilizers. The emulsifying agents, also known as surface active agents, concentrate at the interface of the two phases and prevent coalescence of the dispersed phase when agitation stops. The stabilizers are usually thickening agents for the water phase and promote stability partly by reducing the mobility of the dispersed particles. Other factors in promoting stability are the fineness of dispersion and the chemical stability of the system

#### Emulsifying Agents

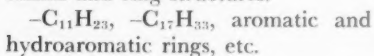
**A**N emulsifying agent concentrates at the interface of two immiscible liquids because part of its molecule is soluble in one of the liquids and another part is soluble in the other liquid. This difference in solubility in the molecule is produced by distinct groups known as polar and non-polar groups and examples of each are given below

##### *Polar or Hydrophilic Groups:*



##### *Non-Polar or Hydrophobic Groups:*

These are usually hydrocarbon chains and ring structures.



##### *Polar and Non-Polar Molecules:*

Polar molecules contain both polar and non-polar groups arranged in an unsymmetrical manner. Examples are ethyl alcohol  $\text{CH}_3\text{CH}_2\text{OH}$  or oleic acid  $\text{C}_{17}\text{H}_{33}\text{COOH}$ .

Non-polar molecules are completely symmetrical such as ethane  $\text{CH}_3\text{CH}_3$  or benzene  $\text{C}_6\text{H}_6$ .

In some polar molecules the polar and non-polar groups are distributed promiscuously in the molecule but in others they are concentrated in two definite locations. Molecules of the latter type are known as polar-non-polar molecules. They frequently act as emulsifying agents because one part is hydrophilic and soluble in water and other polar materials, and the other part is hydrophobic or non-polar and is soluble in oil and non-polar materials. A typical example is soap which may be represented as

sodium oleate,  $\text{C}_{17}\text{H}_{33}\text{COONa}$ . The strongly polar sodium is soluble in water and the strongly non-polar hydrocarbon dissolves in oil. If the hydrocarbon chain is replaced with a methyl group, it would produce the water soluble sodium acetate,  $\text{CH}_3\text{COONa}$ , which obviously would not have any emulsifying properties.

When kerosene and water are shaken together they separate into two layers almost immediately after agitation stops. However, if a small amount of soap is dissolved in the water an emulsion will be formed and the kerosene will remain dispersed in fine droplets.

Figure 1 presents a highly simplified picture of emulsification. The size of the droplets of the dispersed phase will depend on the degree of agitation during emulsification and other factors. Small droplets of the dispersed phase produce more stable emulsions than large droplets, and it is desirable to have them as uniform in size as possible. There is also a great variety of emulsifying agents but they may be classified into three groups namely; anionic, cationic and non-ionic. These terms are based on the behavior of the agents when dissolved in water.

There are two general classes of molecules which dissolve in water: those which ionize to form positive and negative ions, such as common salt ( $\text{NaCl} \rightarrow \text{Na}^+ \text{Cl}^-$ ) and those which do not ionize, such as sugar. It will be noted that the soap molecule in figure 1 is shown as the positive sodium ion,  $\text{Na}^+$ , and the negative ion,  $\text{C}_{17}\text{H}_{33}\text{COO}^-$ . In this case it is the negative ion which determines the emulsifying properties of the soap because if it were replaced with a group such as the acetate  $\text{CH}_3\text{COO}^-$ , it would be useless for emulsification. In electrolysis the negative ion migrates to the anode and is therefore referred to as the anion and, since the anion is the active portion of the soap molecule in emulsification, soap is an anionic emulsifying agent. Conversely, when the positive portion of a molecule is the active part for emulsification it is known as a cationic agent because positive ions migrate to the cathode. There are many materials which dissolve in water without ionizing but which have emulsifying properties. These are the non-ionic agents, ex-

amples of which are given later under emulsifying agents.

In summary, an emulsifying agent should have a polar-non-polar molecular configuration with the polar and non-polar groups forming two distinct parts of the molecule. If the molecule ionizes in water the agent will be anionic if the negative part of the molecule is the determining portion, and cationic if the positive part is the important one. If the molecule does not ionize it will be a non-ionic agent. Of course, in all cases the entire molecule of the emulsifying agent is involved in emulsification and not the ion only.

#### Stabilizers

**T**HERE is a group of materials which are somewhat soluble in water and dilute alkalies which may act in the dual capacity of emulsifier and stabilizer. They are frequently referred to as protective colloids and they give high viscosity in water solution or dispersion. The most important members of this group are casein and its relative soya protein. The other materials include alginates, methylcellulose, starch, dextrin and water soluble gums. These materials promote stability by decreasing the mobility of the dispersed particles. By addition of these water soluble materials the viscosity of the water phase can be increased. It is also desirable to have the two phases of an emulsion as nearly alike in specific gravity as possible so as to avoid slow sedimentation of the heavier phase. This is frequently referred to as the "creaming" of the emulsion.

##### *Phase Volume Ratio*

When the volume of the disperse phase is about equal to the volume of the continuous phase, the type of emulsion which will be formed, O/W or W/O, will depend almost entirely on the emulsifying agent used. Equal volume ratio also produces the most stable form of the particular emulsion. When the oil or disperse phase is greater than 75% by volume there is a marked tendency to form a W/O emulsion instead of the O/W emulsion which is desired. The reverse situation holds if a W/O emulsion is desired. Also dilute emulsions, 25% or less disperse phase, are less stable than more concentrated ones.

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# Clearing Paint Vehicles

ONE of the most important specifications in the production and use of varnishes is that they be, and remain, free from cloudiness of any type, and that for many purposes they must remain as clear as water. It is usually necessary, for this reason, to subject the natural products to a clearing and decolorizing process. In the case of clear varnish films to be applied to light colored bases it may be necessary to clear and decolorize even the synthetic products. These treatments may not be as necessary in the case of very dark and pigmented varnishes although it is a frequent observation that the untreated materials exhibit less "fiery" hues than the treated varnishes. There have been many notable advances in this direction during the last ten or fifteen years, although there is little doubt that in many instances the older processes yield practically similar results at lower cost of installation and processing than some of the modern processes developed in Europe and America. It may be of interest to compile the most important advances achieved in this direction during the last ten or twelve years.

## Cellulosics & Shellac

IT is a well known fact that dilute solutions of cellulose derivatives can be satisfactorily cleared and decolorized merely by passing them through a bed of active carbon, infusorial earth or Fuller's earth. It was found that dissolved lacquers made from cellulose derivatives and treated with active carbon from  $\frac{1}{2}$  to 3 hours followed by filtering through silica gel are considerably improved, especially with regard to their purity, fire resistance and rust protection capacity.

Much more difficult is the clearing and discoloration of shellac solutions, which in their crude condition usually are contaminated with numerous tenacious impurities of a more or less dark coloration. It is sometimes possible to clear and discolor them by chemical means, a fact probably due to the very considerable differences of composition and properties of the raw materials employed. The author has often been able, for instance, to bleach alcoholic shellac solutions by adding a certain amount of concentrated hydrogen superoxide ("Perhydrol") and permitting it to act under the influence of direct sun rays. In other instances this process did not lead to satisfactory results, while in still others the quality of the materials treated were actually deteriorated by the same treatment, although tentatively applied under various different conditions.

It is obvious that for this reason there has been much experimental and research work on this particular problem, the bleaching and discoloration as well as general refining of shellac by chemical processes. It is true that shellac can practically always be bleached with high grade active carbon including special products but it is also a matter of experience that satisfactory results require the use of relatively very large percentages of active carbon, occasionally up to 25 percent. It is true that the improvement of quality effected by this treatment justifies the expense of this treatment, but it has gradually been possible to improve on this and similar processes.

## Other Factors

MUCH depends upon the condition of the shellac and upon the various accompanying factors

such as time, temperature, pressure, degree of dilution, types of solvents, etc., and the processes selected must be adapted to the various technical and economic conditions in question. It is possible, for instance, to obtain a discoloration of almost 90 percent by treating alcoholic shellac solutions for 24 hours in two steps of 12.5 percent active carbon each, while dark crude shellac dissolved in approximately three parts of alcohol requires about 48 hours for satisfactory bleaching. After filtering, the alcohol is distilled off and the bleached shellac is used in form of small scales. Chief conditions for successful bleaching of these materials are:

- 1) The alcohol must not contain too much water.
- 2) The shellac must not contain salts or any other substances outside of the usual coloring matter.
- 3) The active carbon must be pure and of high quality.

A new process of refining crude colophony has been developed by *K. Holowiecki (Poland)*. The crude material is dissolved in benzene or carbon tetrachloride so as to obtain a 50-percent solution. This solution is then treated for two hours with a mixture containing 95 percent of bleaching earth and 5 percent of active carbon at temperatures of from 65 to 90 degrees Centigrade. It is absolutely necessary during this stage of the process to exclude even traces of moisture from the mixture or reaction. It is also necessary for best results to add the bleaching substances in small portions every 30 minutes.

## Clearing Cumaron

THE *Cumaron* and *Cumaron-Inden* resins obtained by washing certain fractions of the anthracite distillation products represent valuable raw material in the production of varnishes. The trouble is that this material as originally produced is soft and of a rather dark color. It has been possible, however, to develop a number of bleaching and hardening processes. The most modern bleaching agents used for this purpose are active clays, while the solvents employed include various aliphatic hydrocarbons such as naphtha, hexane,

(Turn to Page 17)



## ... EMULSION PAINTS

(From Page 10)

### Particle Size

Emulsions are described as coarse or fine, depending on the size of their dispersed phase droplets. The optimum size is between 0.5 and 1.0 microns and the droplets should not be greater than 1.5 microns in a fine emulsion. The droplets in a coarse emulsion may range between 5 and 15 microns and a size of 20 microns usually indicates partial coalescence, preparatory to breaking of the emulsion.

It is desirable to have the droplets all of uniform size, but in practical emulsions this is impossible. The particle size of the disperse phase is determined by the extent of agitation during emulsification, and by using the correct amount of the proper emulsifier for the particular emulsion. In some cases it is possible to decrease the particle size of a coarse emulsion by putting it through a homogenizer or high speed colloid mill. On the other hand, some emulsions will break if subjected to mechanical agitation.

### Temperature Limitations

A properly formulated emulsion is stable over the normal temperature range but may be broken by freezing or by temperatures in excess of 160° F. Obviously if the continuous phase is frozen, the condition at the interface changes from liquid to solid which upsets the nicely balanced film of emulsifying agent concentrated there. Sometimes the emulsion may be reformed by sufficient agitation but this is not always possible.

When the temperature is raised appreciably, the viscosity and the interfacial tension changes, and again the balanced film of emulsifying agent is destroyed. A proper balance of stabilizers improves heat stability, but there are definite limitations in this direction.

### Chemical Stability

An emulsion is a very carefully balanced physical system which can be destroyed by chemical changes which may take place as the emulsion ages. This applies particularly to the emulsifying agent because of its

relatively small concentration and vital function at the interface. Therefore, the agent must be resistant to the pH range of the emulsion and must not hydrolize or decompose by bacteriological action. Casein is susceptible to the latter action and preservatives must be included to prevent it. Casein will also form insoluble calcium caseinate in the presence of soluble calcium compounds, therefore these should be avoided. This also applies to other types of agents which have low calcium tolerance.

### Materials

**W**ATER paints may be marketed either in the dry powder form or in the paste or liquid form but, of necessity, emulsion paints must be in the liquid form. In the interest of maximum economy it is desirable to market them with a minimum water content, therefore they are usually packaged at paste consistency. These paste paints are thinned with water to application consistency and usually require 1/2 gallon of water to 1 gallon of paste paint. A large proportion of these paste paints are used for interior purposes and are white or light tints.

Many of the materials used in oil paints are quite satisfactory for emulsion paints, however, there are some notable exceptions. It is difficult to generalize regarding these exceptions because the emulsions vary widely in pH, type of emulsifying agent, etc. The following general discussion will indicate some of the important factors in emulsion paint formulation.

**General Composition:** Hiding Pigments, Extender Pigments, Drying Oils, Oleoresinous Materials, Emulsifying Agents, Preservatives, Anti-Foam Agents, Driers, Solvents, and Water.

### Pigments

A good range of white hiding pigments is available for emulsion paint formulation and they are described in the trade literature. They include the titanium pigments, zinc sulphide and lithopone. The water dispersible types are to be preferred to the regular grades. However, care should be taken to select the right type for specific cases. For example, certain lithopones have a tendency

to darken on exterior exposure particularly when used in emulsion vehicles. The titanium calcium pigments are not safe to use when casein or other emulsifying agents which lack calcium tolerance are present in the emulsion because of the tendency to form insoluble caseinate or other insoluble compounds. This limitation also applies to calcium type extender pigments such as whiting. However, these pigments may be entirely satisfactory with emulsions which do not contain casein or calcium sensitive emulsifiers.

With the exception noted above the regular extender pigments are widely used. Diatomaceous silica imparts excellent brightness to the dry film and water ground mica generally improves brushing characteristics flow and leveling. The magnesium silicate pigments are satisfactory and certain clay pigments have been developed especially for emulsion paints. Barytes may be used, but its high specific gravity promotes more rapid settling.

Great care must be taken in the selection of pigments for dark color emulsion paints. If the emulsion is alkaline, such pigments as iron blue, chrome green, chrome yellow and others which are sensitive to alkali cannot be used. A pigment which may not be affected by alkali may have a pH on the acid side when dispersed in water and may therefore be unsatisfactory. In general, carbon black and many organic pigments unless specially treated, tend to change an O/W emulsion to the W/O type. Frequently it is necessary to reformulate the emulsion for dark colors by adjusting the emulsifying agent and the stabilizer. Satisfactory dark colored emulsion paints can be made, as seen by the large gallage used for camouflage purposes in the last war. However, tests should be made with specific pigments and emulsions to be certain that they will have the necessary stability.

### Oils and Resinous Materials

The choice of an oil, resin or varnish for use in an emulsion paint is governed by cost, availability and performance requirements. Since it is possible to emulsify any type of oil or resin, there is no limitation from this point of view. In general, the oils and resins are used without organic solvent so as to avoid the odor and



fire hazard. However, there are some emulsion paint formulations (16), (30) which have been suggested which contain volatile organic solvents. An indication of the range of oils and resins used in emulsion paints may be obtained from the following partial list. Further details are given in the literature review. Water Soluble Linseed Oil, 12½ gallon Ester Gum—Linseed Varnish, 40 gallon Ester Gum—Linseed Varnish, 50 gallon Ester Gum—Linseed Varnish, Phthalic Alkyd Resins, Non-Phthalic Alkyd Resins, Carbic Anhydride Resins, Coumarone—Indene Resins, and Polystyrene.

In some instances mixtures of the above are suggested. It has been stated (19) that excellent emulsions may be made from varnishes containing natural or synthetic resins of the ester gum, maleic, phthalic, phenolic or terpene types. The oil length may also be varied as, for example, from 10 to 50 gallons without significantly changing the properties of the emulsion. Of course, there would be a difference in the dry film properties due to this difference in oil length.

#### Emulsifying Agents

The purpose of the emulsifying agent, as discussed in the section on theory, is to prevent the coalescence of the droplets of the dispersed phase. This is done by forming a film of the agent around each droplet. Since this film is only a few molecules in thickness it must be very resistant to physical and chemical changes. emulsifying agents belong in the general class of compounds known as surface active agents. Excellent compilations of these materials are given in the literature (33), (41), etc. A few typical examples are given here to illustrate the types generally used in emulsion paints. These are principally soaps and they may be added as such or formed during emulsification. In the latter case the fatty acid is dissolved in the oil or resin phase and the basic component dissolved in the water phase. For best water resistance in the emulsion paint film, it may be desirable to use a volatile base such as ammonia. Typical emulsifying agents are:

Soaps—Sodium and ammonium oleates and stearates

Acidic materials—For combination with bases, oleic, stearic, abietic, sulphonic acids

Basic materials—For combination with acids—sodium and ammonium hydroxides, triethanolamine, morpholine, 2-amino-2-methyl-1-propanol, and pentamethylene diamine

Anionic type:

Sodium Oleate  $[C_{17}H_{33}COO]^- [Na]^+$

Sodium lauryl sulphate  $[CH_3(CH_2)_{11}OSO_3]^- (Na)^+$

Cationic type:

Laurylammonium acetate  $[CH_3(CH_2)_{11}NH_3]^+ (OOCCH_3)^-$

Nonionic type:

Glyceryl monolaurate  $(CH_3(CH_2)_{10}COO C_3H_5(OH)_2$

#### Stabilizers

The stabilizer is used to reduce consistency change or actual breaking of the emulsion when it is subjected to variations in temperature, mechanical working or other abnormal conditions. Stabilizers are often referred to as protective colloids and the types of materials used are: Casein Soya proteins, Methyl cellulose, Zein, Sodium carboxymethylcellulose, Alginates, Starches, Bentonite.

#### Preservatives

Preservatives are included to prevent decomposition of any proteins which may be used and to eliminate fungus growth on the emulsion paint in part filled containers or on the final dried film. The preservatives must be sufficient to take care of all types of decomposition in either the water soluble materials or the water insoluble portion of the binder. For this reason more than one type of preservative is frequently used. A partial list of those available is: Bichloride of mercury, Thymol and chloroisocthymlol, Sodium trichlorophenolate, Parachlorometacresol, Tribromophenol, Phenol, Dowicide A and G, Santobrite, \* Borax, \* Sodium and ammonium fluorides

\* These have only a weak preservative action.

The bichloride of mercury is the most effective but it is highly toxic to humans. Phenol is also quite satisfactory, but it has a highly objectionable odor.

#### Anti-Foaming Agents

Considerable agitation is required in the manufacture of emulsion

paints and anti-foaming agents are desirable to reduce the large quantity of foam which would be formed. A similar condition exists when the painter brushes the paint on the wall. The brushing action develops considerable air bubbles which do not break until the film is partly set. This produces a pitted surface in the dry film which is very undesirable. A partial list of the materials which have been used on anti-foaming agents is Kerosene, Pine Oil, Anti-Foam H (American Cyanamid Co.), Anti-Foam A (Dow Corning Co.), Foamex (Glyco Products Co.)

#### Metallic Driers

Metallic driers are necessary in emulsion paints which contain oxidizable oils and resins. Any of the regular driers used in the Paint Industry are satisfactory and they are used in approximately the same ratio of metal to oil or resin as in oleo-resinous vehicles. They may be incorporated by cooking into the oil or resin or added in solution form in the regular manner. They are generally added to the emulsion during manufacture but may be added when making the emulsion paint. Care should be taken to see that they are completely dispersed when added to the paint. The small amount of solvent which is added when drier solutions are used has no detrimental effect on the finished product.

#### Volatile Material

The volatile material in emulsion paints is principally water. However, volatile emulsifying agents such as ammonia are frequently used and there may be small amounts of organic solvents derived from drier solutions or anti-foaming agents. Formula suggestions have also appeared in the literature which contain an appreciable quantity of organic solvent. This was necessary because of the use of heat processed oils or varnishes which would be too high in viscosity to handle at 100% solids. In general such solvents must be water insoluble to insure good emulsion stability. Water insoluble solvents may be used in emulsion paints to increase the consistency. Water miscible solvents should in general be avoided because they reduce the stability of the emulsion.

### Methods of Manufacture

THE following discussion of the methods of manufacture of emulsions and emulsion paints applies to the oil-in-water type because this is the principal one in use today. Since we have defined an emulsion as the stable dispersion of two immiscible liquids it is apparent that the manufacture of an emulsion consists of breaking up the oil phase into extremely fine particles, coating them with the emulsifying agent and dispersing them in the water phase. This mechanical mixing of the two phases may be done with several types of mixers and the type used will depend on the relative ease of emulsification of the particular emulsion, its consistency and required degree of fineness of the dispersed phase. The mixers include the pony and heavy duty mixers, variable speed mixers of several designs and colloid mills. The stability of an emulsion depends a great deal on the degree of dispersion as well on the materials in the formulation.

Generally, the two phases, oil and water, are prepared separately, then mixed for emulsification. The necessary oils, resins, varnishes, driers and sometimes fatty acids required for the oil phase are prepared and mixed in any type of standard mixer.

The water phase contains the stabilizer, which may be a protein, alginate, methyl cellulose, etc. It also contains the emulsifying agent, preservative when necessary, and the antifoam agent. The method of dispersing the stabilizer in the water phase will vary with the type used. When casein or soya protein is used, a covered tank with a good agitator and means for heating and cooling is necessary. The protein is first thoroughly mixed with water until it is completely wetted. Then an alkaline material or other solubilizer is added to promote solution and the temperature is raised to 180° F. Continuous agitation should be maintained. The preservatives and antifoam agents are then mixed in, and the solution allowed to cool and stand at least overnight to reach its maximum viscosity. Usually the emulsifying agent is added at this point. However, it may be formed in the emulsification such as a soap formed from a basic material in the water phase and a fatty acid in the oil phase.

After both phases are prepared, the oil phase is added to the water phase in a suitable mixer. This is a very critical stage of emulsion manufacture and the exact conditions of concentration, rate of addition, speed of agitation and temperature will vary considerably with different materials. When the emulsion is completed in the mixer, it is advisable to run it through a colloid mill to insure fine and uniform particle size and good stability. For small scale operations it may be convenient to prepare the water phase and then add the oil phase in the same equipment, but better control is obtained by preparing the two phases separately. Frequently, very stable emulsions can be made in simple mixing equipment and normal room temperatures. The efficiency of the emulsifying agent is a factor in such cases but the type and condition of the oil phase is also important. When the viscosity of the oil phase is quite high it will be necessary to heat it for proper handling.

The stability of a pigmented emulsion paint is usually much better than the unpigmented emulsion. Consequently, it is desirable to pigment the emulsion as soon as possible after it is made. The pigments must be selected carefully, as discussed in a previous section, then added to the emulsion in a standard pony or heavy duty mixer. In some cases, a thorough mixing is all that is necessary. For other requirements it may be necessary to grind the paste in one of the standard mills used for regular oil paints, and for certain special cases the paint may be run through a colloid mill. Mixing and milling usually generates some heat which lowers the viscosity sufficiently for handling the heavy paste paint.

The above represents the general procedure for making emulsion paints and, of course, it may be varied considerably to suit special requirements. For example, in the literature reference #17-a it is suggested that the pigments be mixed first with the water phase and the emulsion stirred in afterwards. Again in reference 37 for gloss emulsion paint, it is suggested that the pigment be ground into the oil phase before emulsification. This procedure may also be used in flat emulsion paints but the high proportion of pigment increases the consistency greatly and involves a larger volume

of material to be emulsified which would, in turn, require more emulsifying agent. The increased proportion of emulsifying agent may increase the cost and detract from film properties. On the other hand the regular pigments could be used instead of the water dispersible type generally recommended for emulsion paints.

In general, emulsions are stabilized sufficiently to withstand the mixing and milling operations. However, under excessive mechanical action, or in cases where the emulsion does not have sufficient mechanical stability, the emulsion may break in the mill or mixer.

Emulsion paint is usually packaged as a paste paint which is thinned for application with 1/2 gallon of water to each gallon of paste paint. This lowers the cost to the consumer because of the greater concentration of paint in the container. It also avoids excessive pigment settling, and "creaming" or separation of the emulsion.

### Control Tests

ADEQUATE methods of control for all phases of dispersion, emulsification and pigmentation must be established and maintained to insure stability and uniformity.

The protein or other stabilizer must be tested for variations in solubility, viscosity and stability. The pH of this solution should be checked carefully and the chemical stability of the emulsifying agent and the preservative should be investigated.

The emulsion should be examined with the microscope for particle size at from 400 × to 900 ×. The pH must be maintained within specified limits and the viscosity checked both initially and after aging. Loss of viscosity on aging may indicate an increase in particle size due to coalescence or to some decomposition but either will give poor stability in the emulsion paint.

The emulsion paint should be given the usual control tests of consistency, weight per gallon, color and hiding power. In addition, the pH should be checked and also stability as indicated by consistency change when aged at room temperature, elevated temperature (120° to 150° F.), and freezing temperature. The usual application tests of reduction for

brushing, ease of brushing, flow or levelling and degree of sheen are necessary. It is also desirable to make wet abrasion tests on the dried film, particularly if the paint is intended to meet certain government specifications. Another important test from the painter's standpoint, is the ease with which the brush may be cleaned with ordinary water.

One of the big advantages of emulsion paints is their ease of brushing. The continuous phase, which determines brushability, is practically water and so the paint must be easy-brushing. However, at some stage before the film dries the emulsion must "break", then the oil or resin becomes the continuous phase. Obviously, if breaking occurs too soon, the brushing will be difficult and good lapping will be impossible. The proper choice of emulsifying agent and the correct amount of stabilizer will prevent premature breaking. This will also control the ease with which the paint may be washed from the brush after use.

Other advantages of emulsion paints are little or no odor, absence of organic solvents, therefore less fire hazard, rapid drying, clean colors and good washability. Excellent flats are made with very low sheen and some gloss emulsion paints have been marketed. Theoretically, a high gloss emulsion paint is not feasible. When the emulsion breaks, a small amount of water remains in the oil phase and this non-miscible material reduces the gloss as it leaves the film. High-boiling, water miscible solvents would improve this situation but these tend to lower the stability of the emulsion. High gloss should be possible with a water soluble oil phase instead of an emulsion but this would entail difficulty with scrub resistance. Emulsion paints are satisfactory over plaster, cement and other porous surfaces. The surface does not have to be as dry as required for oil paints, but obviously a slow seepage of water through the wall is not a satisfactory condition for painting.

Since the water phase in emulsions is the continuous phase it is the principal factor in determining the consistency of emulsions. This means that the consistency is practically independent of the viscosity of the disperse phase. It will be apparent that this permits the use of high polymeric materials which have unique film forming properties.

In general, emulsion paints are not recommended for application to bare wood because of grain raising, nor to metals where corrosion may be incited. However, they are entirely satisfactory over these surfaces when primed with a suitable primer.

The phenomenal growth of the emulsion paint industry over the past decade is good evidence that emulsion paints satisfy certain definite demands of the consumer. The features which appeal to the master painter and the householder are: easy brushing, fast drying, good dry hiding and lack of paint odor. Emulsion paints also meet the requirements of good durability and washability.

Emulsion paints produce excellent flat finishes with very low sheen. Considerable progress has been made in the production of high gloss finishes and there is active development work being done on this problem at present.

The fact that any oil, resin, copolymer or high polymer may be emulsified and then pigmented indicates a wide field for expansion in emulsion paints. Recently both polystyrene and polystyrene copolymer emulsions have appeared on the market as suggested vehicles for emulsion paints.

It would appear that the oil paint manufacturer must take cognizance of competition from emulsion paints. At present, this seems limited to interior paints and exterior paints on cement. However, the future may see emulsions of polymeric non-oxidizing materials as paint vehicles for exterior wooden surfaces. Such materials may not be subject to the severe hardening and ageing failures associated with the oils used at present.

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Literature survey for this article will be included in the Jan. issue.

#### DeLand of Canco Succumbs

Daniel B. DeLand, assistant to the vice president in charge of manufacture of the American Can Company, died in his home recently. He was 64.

Mr. DeLand was a pioneer in the modern can making industry, having started working as a youth with the former Cobb Preserving Company at Fairport, N. Y. He was closely associated with the late George W. Cobb in the days when the Sanitary Can Company was being organized in 1904, and joined the American Can Company a few years later when Sanitary became a part of the larger organization. Mr. DeLand was soon named superintendent of the Fairport plant. Not yet 23 at the time, he was one of the youngest men in the company to hold that position. He remained as plant superintendent under the subsequent ownership by American Can, and in 1919 was promoted to division superintendent for the Northeast Division. Seven years later he was transferred to New York as division manager of manufacture for the Atlantic Division. He became assistant to the vice president in early 1948.



# New

## Uses for Teflon

FOR a number of years widespread use of "Teflon" tetrafluoroethylene resin has been held up by difficulties encountered in fabricating it. The very properties that endowed it with great potential industrial value—outstanding heat and chemical resistance—made it difficult to work into readily usable forms. Only by relatively crude methods could sheets, rods, tubes, and tape be made from the "Teflon" granules first produced commercially in Du Pont's plastics plant at Arlington, N. J.

### Teflon Coatings

SOME time ago, company chemists came to realize that fabrication difficulties were lessened as the granules were made smaller. More recently, it was discovered that the material could be made as a suspensoid. In this form the particles are so fine that they remain suspended in the carrying liquid, with little or no settling, for considerable periods of time.

"Teflon" suspensoid looks like milk or cream, depending upon the amount of solid in suspension. This ranges from 35 to 65 per cent by weight. Using the suspensoid as raw material, chemists in the company's Fabrics and Finishes and Polychemicals departments discovered spray finishes that make it possible to give chemical tanks a tough lining; enamels for insulating fine electric wire; compounds for extruding heavier insulation onto wire; unsupported film and tapes, that is said to be superior to those previously available; and coated glass fabrics and tapes.

The finishes, wire enamels, and coated fabrics are being produced in experimental quantities only. The

"Teflon" suspensoid, extrusion compounds, and film are being manufactured for experimental purposes also.

### Application Methods

THERE are three types of "Teflon" spray-coatings—primer, intermediate, and finish. The process for applying each is similar. Before spraying the primer, it is necessary to clean the metal surface, washing off grease with a solvent and, preferably, sand blasting to assure the best possible adhesion. After spraying, the coating is air-dried, or force-dried at temperatures below 200 degrees F. to drive off the carrying liquid. The metal is then heated, either by baking in an oven or by spot-heating, until the temperature is brought to around 750 degrees F. At this point, the tiny particles of solid tetrafluoroethylene turn to jelly and fuse together, giving a continuous film. As the metal cools, the film becomes solid.

Each step in the finishing process is marked by a change in the appearance of the film. When first sprayed on, the finish remains clear. As it dries it becomes milky. As it fuses it changes from milky to translucent. If thin spots are found, or damage occurs after use, the finish can be patched by cleaning down to the metal, applying more spray finish, and fusing with blow torch or gas flame. Repairs can be made in 15 or 20 minutes.

Tetrafluoroethylene resin finishes will adhere to many metals, such as steel, stainless steel, aluminum, brass, copper, and to glass (after sand-blasting), porcelain, and brick.

The total thickness of these finishes necessary to give protection against corrosion depends upon the nature of the chemical to which the finishes are

to be exposed. In general, four to six coats will suffice, a primer about three-tenths of a mil thick and intermediate and finish coats of a mil each, the total having approximately the thickness of a dollar bill. For ultimate protection against the more corrosive chemicals, a greater margin of safety can be obtained by building up a heavier film.

Laboratory experience indicates that tetrafluoroethylene resin finishes possess a moderately high degree of resistance to erosion, or wear. Their capacity to withstand sudden changes in temperature is indicated by the fact that, in the laboratory, finishes fused at around 750 degrees F. were actually toughened when cooled by quenching with water. After the carrying liquid has been driven off, the finishes have the chemical and heat resistance and, for many purposes, the electrical insulating properties of "Teflon" in other forms.

Other indicated uses for the spray finishes are coatings for chemical pipes and fittings, for agitators and rupture disks in chemical process vessels, and laboratory benches and hoods. Electrical properties of the finishes may be utilized for insulation of equipment in electrolytic processes. Field tests are being made of the material in electroplating tanks and on racks.

### Electrical Properties

THE fusing of "Teflon" wire enamels is comparable to that of the spray finishes, although application is by dipping. Standard wire-coating machines are employed after installation of special applicators. This takes about a half-hour.

It has been demonstrated that a motor or transformer insulated with this resin may be operated con-



tinuously at from 400 to 500 degrees F. This means that more current can be put through the unit and more power obtained from the equipment. By insulating with "Teflon", the horsepower output of a motor can be increased substantially, or, conversely, it is possible substantially to reduce the size of the motor and get the same output. In the case of one large motor for example, output was increased by over 40 per cent. Also by use of "Teflon" insulation, it is possible to design a transformer that would weigh one-third as much and have much longer life than one with conventional wire-coating insulation.

While weight and space-saving are vital considerations in the design and performance of aircraft—a big transport plane, for instance, may carry as many as 30 electric motors and 30 transformers—they may be equally important in the manufacture of other things. To take one example, the smaller the mechanical unit in a food freezer, the larger the storage space.

Extrusion compounds of tetrafluoroethylene resin have been developed for heavier insulation than is possible with the wire enamels. Coatings ranging in thickness from five to twenty mils have been applied to wire, in the laboratory, by use of a ram extruder. The wire passes through the center of the piston and the compound is forced through a small orifice around the wire which then moves into a heated chamber where the liquid is evaporated and the resin particles fused—at 700 degrees F.—into a tough, homogeneous coating.

The heavier coatings have exceptional dielectric properties at high-frequencies and, for this reason, are expected to be adopted widely for radar and television installations. They also are expected to be used as insulation for aircraft ignition, thermocouple leads, wire in electric ranges and other appliances, large motors, transformer coils, and other electrical equipment.

#### Other Uses

GLASS fabrics coated with "Teflon", and the unsupported film, will complement the wire enamels and extrusion coatings in electrical equipment, and also will have non-electrical applications. The coated fabrics

may be used in the electrical industry as slot liners, coil wrapping, layer insulation, and, possibly, as a substitute for mica sheet in transformers and condensers. In the chemical industry, the fabrics may be used in the manufacture of protective clothing, or as gasgets, conveyor belts, and flexible ducts for hot, corrosive gases.

In effect, the coated fabrics are simply sheets of "Teflon" tetrafluoroethylene resin reinforced with glass cloth, and these may be laminated into strong, solid material of almost any desired thickness by bonding under heat and pressure.

One of the uses for unsupported "Teflon" film and coated fabric is as electrical tapes. They may be employed for wrapping electric coils, or as protective layers between coils, or as condenser films.

It is felt that the new forms of "Teflon" will have many more applications than those already foreseen, and, in an attempt to develop them, Du Pont is soliciting the cooperation of research organizations in many fields.

#### ... COLD-HARDENING

(From Page 7)

##### Example No. 2

One hundred parts of the lacquer described in Example No. 1 are mixed with 5 g of dimesylimide and 1 g of an acid chloride after being dissolved in alcohol. During a period of 21 days oiled silk fabrics and similar products may be manufactured by means of the dark-red solution.

Furthermore it has been found that dimesylimide has an equally stabilizing effect in mixtures of phenolic resin lacquers with polyamide solutions.

##### Example No. 3

The 50% "Luphen H"—lacquer mentioned in Example No. 1 is mixed with a solution of a triply mixed polyamide of hexamethylene diamine, adipic acid, amine of ketopimelic acid and caprolactam in a mixture of 34% of methylene chloride, 34% of methanol (80%), 12% of isopropanol (80%) and 20% of ethylene chlorohydrin in a ratio of 9:1 or 7:3, as computed for solid film-forming substances; 10% or

dimesylimide, in proportion to solid phenolic resin are subsequently added. After 7 weeks the solution can still be processed satisfactorily, and can be used for coating metal, wood or protecting textiles, etc.

With respect to the flexural stress of the lacquered metals, it is clearly seen that the coatings hardened by means of dimesylide are considerably more flexible than analogous coatings containing acid chlorides as hardening agents.

#### ... CLEARING

(From Page 11)

etc. The active clays employed for this purpose must be in highly dispersed state, the optimum temperature of reaction ranging between 100 and 150 degrees Centigrade.

Many of these and other processes developed especially for bleaching purposes require closest attention to details. This applies particularly to the treatment with active carbons, clays, etc. Unsatisfactory results are frequently obtained due to excessively rapid filtering or to incorrect preparation of the filter beds. It is absolutely wrong to maintain loose filtering beds in order to facilitate filtering operations. Apart from the fact that a certain degree of filter density is required to attain maximum filtering effects, the solutions tend to force channels through filter beds if packed too loosely. Another modern principle is to stir the solution above the filter bed throughout the entire operation. Suitable stirring mechanisms having been developed for this purpose.

#### Hercules New Assignments

Expansion in the sales and development activities of CMC, Hercules Powder Company's cellulose gum, has brought about two new assignments in personnel here. Effective December 1, Leland H. Burt will be supervisor of CMC development and Werner C. Brown will be supervisor of CMC sales.

Hercules CMC, also known as sodium carboxymethylcellulose, can be readily dissolved in either cold or hot water to form colloidal and highly viscous solutions possessing marked suspending, thickening, stabilizing, and film-forming properties.

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Paper Coatings  
Farm Implement Finishes  
Engine Enamels  
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Clear Wood Finishes  
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Wipe-on Furniture Polishes  
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Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired to Lancaster, Allwine & Rommel.

## Titanium Dioxide Pigments

*U. S. Patent 2,488,440. Holger Heinrich Schaumann, Newark, Del., assignor to E. I. duPont de Nemours & Company, Wilmington, Del., a corporation of Delaware.*

A process for producing a titanium oxide pigment comprising reacting titanium tetrachloride in the vapor phase at an elevated temperature of at least 800° C. with an oxygen-containing gas, effecting said reaction over a time period ranging from .01 to 5 seconds and in the presence of small amounts of water vapor ranging from .05% to 10% by volume, based on the total volume of gases being reacted and generated in situ with the reactants, and recovering the resulting TiO pigment.

## Cellulose Ethers

*U. S. Patent 2,488,631. Walter B. Kunz, Fredericksburg, Va., assignor, by mesne assignments, to American Viscose Corporation, Wilmington, Del., a corporation of Delaware.*

In a process for the manufacture of hydrophilic cellulose ethers which are soluble in aqueous media comprising the steps of converting a cellulosic material to alkali cellulose by subjecting it to the action of an aqueous solution of an alkali metal hydroxide pressing the alkali cellulose to remove excess alkali solution, etherifying the alkali cellulose while wet with said alkali with an etherifying agent selected from the group consisting of alkylating agents and hydroxy-alkylating agents until a cellulose ether is produced, neutralizing the alkali

in the reaction mixture, and removing water from the reaction mixture, that improvement which comprises neutralizing the reaction mixture with an acid selected from the group consisting of organic and inorganic acids the hydrated alkali metal salts of which formed from the particular alkali metal of the aforementioned alkali metal hydroxide are stable up to at least 35° C. the neutralization being effected below the decomposition temperature of the particular hydrated alkali metal salt whereby water is combined in said hydrated salt as water of crystallization during the neutralization, and removing the major portion of the remaining uncombined water in the neutralized product by drying the product without separation of the hydrate from the product at a temperature below the decomposition temperature of said hydrate.

## Titanium Dioxide

*U. S. Patent 2,486,465. Lewis C. Copeland, Palmerton, and Clayton W. Farber, Boumanstown, Pa., assignors to The New Jersey Zinc Company, New York, N. Y., a corporation of New Jersey.*

In the process of producing rutile titanium dioxide pigment by hydrolysis of a titanium sulfate solution to precipitate anatase titanium dioxide and calcining the anatase at an elevated temperature for a period of time sufficient to convert it to rutile, the improvement which comprises effecting conversion of the anatase to rutile without excessive growth of particle size and in the absence of a conditioning agent or rutile seed for promoting such conversion by first removing the  $P_2O_5$  during the course of the production of the anatase in such manner that its  $P_2O_5$  content is below 0.025% on the basis of the  $TiO_2$ , and then directly effecting conversion of the anatase predominantly to rutile without deterioration of its pigmentary qualities by calcining the resulting substantially phosphorus-free anatase product at a temperature of 900-975° C. for a period of 1 to 2 hours.

## Condensation Polymers

*U. S. Patent 2,488,883. Edward C. Shokal, Oakland, and Paul A. Devlin, San Francisco, California, assignors to Shell Development Company, San Francisco, Calif., a corporation of Delaware.*

A polymer of the condensation product of 5% to 95% by weight of formaldehyde condensed with 95% to 5% by weight of a neutral ester of (I) an acid of the group consisting of the ketomonocarboxylic acids wherein the carboxyl group is separated from the keto group by a chain of three aliphatic carbon atoms and ketodicarboxylic acids

wherein at least one carboxyl group is separated from the keto group by a chain of three aliphatic carbon atoms, and (II) a monohydric aliphatic alcohol possessing a single olefinic group between two aliphatic carbon atoms, one of said carbon being not more than two carbon atoms removed from the carbon atom bearing the hydroxyl group.

## Fatty Acid Compounds

*U. S. Patent 2,488,999. Harry M. Ullmann, Bethlehem, Pa.; Rachel Miffin Ullmann executrix of said Harry M. Ullmann, deceased.*

The process of forming a complex, which comprises reacting a compound containing a nonconjugated unsaturated nonhydroxylated fatty acid grouping having from ten to twenty-four carbon atoms in its carbon chain at the carbon chain with an acyclic olefinic acid having less than 10 carbon atoms in its carbon chain and then heating the adduct thus produced at a temperature of between 70° and 130° C. with a compound if the group consisting of ricinoleic acid and its completed esters to form a complex.

## Production of Siloxanes

*U. S. Patent 2,489,138. James Franklin Hyde and William Herbert Daudt, Corning, New York, assignors to Corning Glass Works, Corning, New York, a corporation of New York.*

The method of preparing siloxanes which comprises interacting hexamethyldisiloxane and a cyclic dimethylsiloxane in intimate contact with an alkali metal hydroxide.

## Oxidized Drying Oil

*U. S. Patent, 2,488,680. Izador J. Novak, Trumbull, Conn., assignor to Raybestos-Manhattan Inc., Passaic, N. J., a corporation of New Jersey.*

The method of inhibiting darkening of vegetable drying oil which has been oxidized by treatment with an oxygen-containing gas at a temperature below 250° F. on subsequent heating above said temperature, which comprises water extracting said oxidized oil prior to said further heating thereof, adapted to carry depending needles bearing on said strips, a lead screw journaled in said frame and operatively connected to said carriage to advanced the same, multi-speed gear box coupled in driving relation to said lead screw, a constant speed motor coupled in driving relation to said gear box, a pointer actuated by said carriage and a multi-sided scale revoluble about an axis extending longitudinally of said frame to present any desired side to said pointer, the sides of said multi-sided scale bearing calibrations proportioned in relation to the speeds of said multispeed gear box.



### Production of Disiloxanes

U. S. Patent 2,489,139. James Franklin Hyde and William Herbert Daudt, Corning, New York, assignors to Corning Glass Works, Corning, New York, a corporation of New York.

The method of preparing a hexaorganodisiloxane, which comprises interacting two differently substituted hexaorganodisiloxanes in which the organic groups are selected from the group consisting of alkyd and monocyclicaryl radicals, said radical being attached to the silicon by carbon to silicon bonds, in intimate contact with an alkali metal hydroxide, whereby shifting of the triorgano silicon groups occurs with formation of hexaorganodisiloxane which contains triorgano silicon groups corresponding to the triorgano silicon groups of the reacting disiloxanes.

### Polymerization of Olefins

U. S. Patent 2,488,736. Frederick A. Palmer, Wooster, Tex., assignor by mesne assignments, to Standard Oil Development Company, Elizabeth, N. J., a corporation of Delaware.

A method for polymerizing a monoolefin and diolefin under conditions to form a high molecular weight rubbery polymer which comprises dividing a first stream of anhydrous alkyl halide into second and third streams of alkyl halide; saturating said second stream with water, contacting said water-saturated stream with a Friedel-Crafts catalyst to form a first solution of Friedel-Crafts catalyst in alkyl halide, admixing said first solution with said third stream to form a second solution of Friedel-Crafts catalyst, forming a feed stream of monoolefin and a diolefin at a temperature in the range between  $-50^{\circ}$  and  $-175^{\circ}$  F., contacting said feed stream with said second solution at a temperature in the range between  $-50^{\circ}$ – $-175^{\circ}$  F. for a time interval sufficient to cause polymerization of said hydrocarbons to a rubbery polymer and recovering said polymer.

### Catalyst for Butadiene-Styrene

U. S. Patent 2,488,690. William N. Stoops, Charleston, W. Va., assignor to Carbide and Carbon Chemicals Corporation, a corporation of New York.

The process of polymerizing in aqueous emulsion unsaturated hydrocarbons of the group consisting of styrene, conjugated diolefines, and mixtures of styrene with said conjugated diolefines in the presence of a small amount of a catalyst combination composed of diazoaminobenzene mixed with an activating compound of the group consisting of hydroquinone, monochlorohydroquinone, p-quinone, pyrogallol, quinhydrone, dichlorohydroquinone and catechol.

### Bituminous Emulsion

U. S. Patent 2,481,374. Vilas E. Watts, Los Altos, and Lyndon G. Thompson, Oakland, Calif., assignors, by mesne assignments to Stancal Asphalt and Bitumuls Company, San Francisco, Calif., a corporation of Delaware.

An aqueous alkaline bitumen-in-water type emulsion of a bituminous material selected from the group consisting of hard, brittle asphalts having a 0–5 penetration (ASTM D5–25 at  $77^{\circ}$  F., 100 grams, 5 seconds) and a  $180$ – $240^{\circ}$  F. softening point (ASTM D36–26) and hard brittle coal tar pitches of  $165$ – $240^{\circ}$  F. softening point (ASTM D36–26) said bituminous material being of such hardness that when ground at  $77^{\circ}$  F. it will reduce to a powder and will not stick to the surfaces, which it contacts during grinding, said emulsion having at least about 75% of the bituminous

material particles of such a size distribution that substantially none exceeds 10 microns in diameter and containing as an emulsifying agent an alkali metal salt of a hard high-melting petroleum-hydrocarbon-insoluble, alcohol-soluble solvent-extracted pinewood resin.

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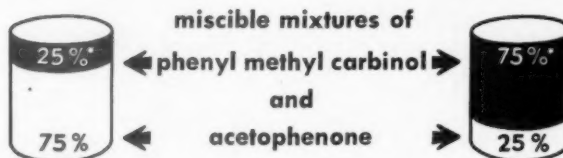
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### 11th Edition of Paint Bible

Published by Gardner Laboratory, 4723 Elm St., Bethesda, Maryland. Price \$20.00 postpaid in U. S. A., \$22.00 elsewhere.

This edition of "Physical and Chemical Examination of Paints, Varnishes, Lacquers and Colors," by Henry A. Gardner and G. G. Sward, contains 70 additional pages of Addenda, giving information on new methods of test and new instruments developed since publication of the tenth edition in 1947, thus making a total of 722 pages.

It contains 758 illustrations, several of which are in color, and 52 charts. Nearly 3000 lines are in the index to facilitate location of subjects. It is bound elaborately, in colored Fabrikoid, with extra heavy board covers, and pure gold stamping.

It contains nearly 200 color chips, including Mass Tones and Tint reductions of various colors, as well as most Army and Navy colors, as heretofore. Moreover, the Army and Navy colors under the old numbers have been compared with the new color cards of the Federal Government, which soon may be issued, and the new numbers of these have been added to the color chips published in this book.

### Practice Recommendations

Published by Dept. of Commerce, National Bureau of Standards, Washington 25, D. C. Price 5 cents.

Printed copies of Simplified Practice Recommendation R144-49, Paints, Varnishes, and Related Products (Colors and Containers), are now available, according to an announcement by the National Bureau of Standards. It will be effective from December 15, 1949, and supersedes the 1945 issue. It was first issued in 1924.

This recommendation lists a variety of oil paints, enamels, varnishes, water-thin paints and related products, and for these items gives the recommended maximum number of colors and sizes of containers for each kind of material. Trade sales items only are included in the simplified list, industrial items being excepted. The new issue adds pint-size containers to those already provided for varnish stains, and oil, spirit, and penetrating stains. It also increases the number of colors for barn

and roof paints from two to three, and the number of colors for texture paints in powder form from three to eight. Copies of R144-49 are for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 5 cents each. A discount of 25 percent is allowed on orders of 100 or more copies.

### Monomers

By E. R. Blout, W. P. Hohenstein, and H. Marks. Interscience Publishers, Inc. 215 Fourth Ave., New York 3. New York. Price \$7.50

The first in a series of monomers has recently been published and covers the following monomeric materials: acrylonitrile, butadiene, isobutylene, isoprene, methyl methacrylate, and vinyl chloride. Other series are under prepa-

ration, and it is expected that they will be published shortly.

Each monomer is discussed in detail. The authors cover the best methods of synthesis on laboratory scale, methods of large scale production, physical and chemical data, information on handling and storage of monomers, stabilizers, methods of removing them, methods of polymerization, catalysts, diluents, and copolymerization studies.

### Feinberg Leaves Subox

Dr. B. G. Feinberg has recently resigned from Subox Inc., where he was engaged in research and development of paints and pigments. He plans to expand his consulting activities and therefore will devote his entire time to consulting services. His office is located at 112 W. 44th St., New York City.



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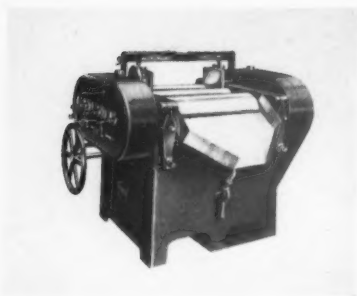
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## THREE ROLL MILL One-point Adjustment

The three roll mill with "one-point" adjustment eliminates the human element in the setting of rolls for grinding, according to the manufacture. Setting is accomplished by simply turning a hand-wheel on the side of the mill. This opens and closes the feed roll and the apron roll simultaneously, keeping them rigidly parallel and in proper relationship with the stationary center roll. A dial just above the hand-wheel plainly indicates each setting, making it possible to chart operations for future grindings. Troy Engine and Machine Co., Troy, Pa. PVP—December.

## PORTABLE GLOSSMETER For Testing Paper

A 75 degree portable glossmeter for testing paper and other materials is available. It consists of an exposure head with lamp, lens and sensitive lightmeter. Power supply may be either a transformer or battery.

This unit is designed for coated-paper, waxed-paper and carton branches of the paper trade. For paints, the new device is useful in the low-gloss range. Price \$172.00. Henry A. Gardner Laboratory, Inc. 4723 Elm St., Bethesda, Maryland. PVP—December.

## AGITATOR Air-driven

Mixer driven by an air cylinder is said to be ideal for handling inflammable or explosive mixtures, since there is no static and the mixer is non-sparking. The oscillating type beater or agitator can be easily removed for cleaning. Speed can be controlled. Mixtures are discharged under pressure, with beater in motion, for delivery through piping to point of use. Union Tool Corp., Warsaw, 12, Indiana. PVP—December.



Union Tool

## RESIN EMULSION Improves Wax Coatings

Arcco 1071-6C, a new styrene copolymer resin emulsion, is available to improve floor wax. As an aid in formulating on a production basis, this resin is added directly to the floor wax emulsion. Sufficient water is then added to reduce solid content to the specifications desired. It is supplied as a 32% solids emulsion weighing 8.75 pounds per gallon and

has a pH of 10 to 11. Shipments are made in carload, ten-drum, one-drum or less-than-drum lots. Samples or trial lots are available. For samples, write American Resinous Chemicals Corp., 103 Foster Street, Peabody, Mass. PVP—December.

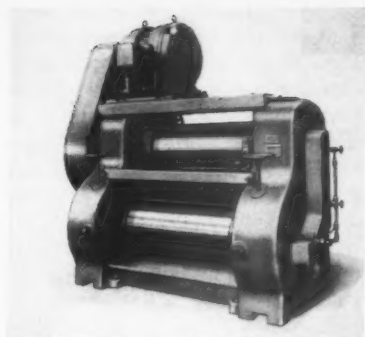
## MONOCHROMATOR For Ultraviolet and Infrared

A universal monochromator, which covers the ultraviolet, visible and infrared regions of the spectrum (1.8 microns to 40 microns) when suitable prisms or gratings are used, is now available. Designated as the Model 83 monochromator, it consists essentially of the company's present model 12 infrared spectrometer optics from entrance slit to exit slit, with the wavelength and slit controls under a standard cover but on a new base assembly. The optics are totally reflecting so that the instrument can be focused with visible light for use in ultraviolet and infrared as well.

The collimator is an 18 degree off-axis parabola of 270 mm focal length, and the effective aperture of the Littrow mount is f/4.5. The prisms available are fused quartz, crystal quartz, glass LiF, CaF<sub>2</sub>, NaCl, KBr or KRS-5. Where it is desired, a 14 degree parabola can be supplied to reflect directly to the Littrow mirror. The Perkin Elmer Corp., Glenbrook, Conn. PVP—December.

Perkin Elmer





J. M. Lehmann

### HEAVY DUTY MILL High Production

The new unit, model number 913A, is a heavy duty, very high production three roll mill and features a verticle arrangement of the rollers which places the hopper approximately 36 inches above the floor level and effects a floor space saving of about 20% over horizontal three roll mills of comparable size. It is reported that single pass production rates of over 250 gallons per hour at a 7.5 North Standard grind have been obtained on a representative basic alkyd enamel mill paste. Companion models for the new mill also are available in smaller sizes. The J. M. Lehmann Co., Inc., 550 New York Ave., Lyndhurst, N. J. PVP—December.

### PAINT REMOVER Less Corrosive

Improved remover is available to paint and allied industries for removing paint, varnish and lacquer films in 1 to 10 minutes, permitting them to be flushed off with water. This remover is said to be non-inflammable and less corrosive to steel, tin-plated steel and aluminum alloys. Dow Chemical Co., Midland, Mich. PVP—December.

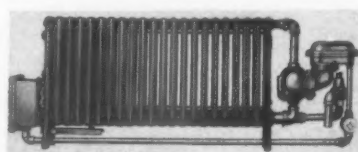
### HAND CLEANER Removes Stains

Sold under the trade-name Flor-life, this hand cleaner is claimed to be nonabrasive and capable of removing paint, varnish, shellac, and color stains. Kencliff, Breslich & Co., 210 E. Ohio St., Chicago 11, Ill. PVP—December.

### ELECTRIC RADIATOR Explosion-Proof

Completely electrical in operation, with thermostatically controlled heat output, this radiator gives trouble-free performance with minimum of attention, according to the manufacturer. All electrical switches and connections are sealed in heavy cast iron housings strong enough to contain a flash, if by chance explosive gases penetrate. Automatic controls prevent internal pressures from building up above 30 pounds p. s. i. All radiators are hydrostatically tested for pressures to 140 pounds p. s. i.

Radiator tubes are of cast iron arranged for maximum radiating surface with minimum weight. Both radiant and convection heat are produced. Radiator comes filled with a solution of water and Prestone-type anti-freeze. Burnham Corp., Electric Radiator Dept., Irvington, New York. PVP—December.



Burnham Corp.

### ORGANOSILICONS May Be Copolymerized

The supply of industrial organosilicon compounds with good thermal stability and rapid curing time promises to be increased by the availability of three new silanes, vinyltrichlorosilane, diethyldichlorosilane, and phenyltrichlorosilane. These new silanes are considered as "building blocks" which can be reacted easily with other organosilicons, alkyd resins, intermediates, and in some cases unsaturated organics, to produce liquid or solid polymers. The manufacturer feels that the availability of these new silanes will implement the increased production of silicone-type materials now used in the paint, electrical, and protective covering fields, as well as encourage research in new products and processes.

The three new silanes, soluble in most organic solvents, are colorless, fuming liquids, with molecular weights ranging from 157.10 to

211.54, and boiling points from 88 degrees C. to 201 degrees C. The great variety of useful polymers possible with these silanes is due largely to highly reactive Si-Cl groups which can convert readily to Si-O, Si-N, Si-S, and other groups. All chlorine atoms in these chlorosilanes can be replaced. Hydrolysis and condensation reactions using suitable catalysts, yield liquid or solid polymers whose composition and properties can be controlled at will, according to the manufacturer.

Pilot-plant quantities of these new silanes are available. New Products Div. of the Linde Air Products Co., 30 E. 42nd St., New York 17, New York. PVP—December.

### AUTOMATIC FILLER Eliminates Hazards

A mechanized and air-operated system fills drums with any kind of oil, vegetable or mineral, paints, varnish, acetates, carbontetrachloride, and other liquids. According to the manufacturer, this filling device will cut off the flow of explosive liquid, without any fire or explosion hazard customarily experienced with electrical equipment. Automatic, air-operated tare beans and other controls eliminate the need for manually or electrically operated controls. It is said that this drum filler will fill a 52 gal. drum of SAE #30 oil in 49 seconds to within an accuracy of 6 oz. of the desired weight. This reduces handling time since one man alone can do the job of filling and weighing the drum with little expenditure of physical effort. The Yale & Towne Mfg. Co., Chrysler Bldg., New York 17, N. Y. PVP—December.

Yale & Towne



## NEW PRODUCTS

### DIALLYLCYANAMIDE

#### Solvent for Resins

This new chemical is a liquid having a boiling point of 222 degrees C. and a freezing point below -70 degrees C. Less than one percent soluble in water at 28 degrees C., Diallylcyanamide is miscible with organic solvents and acts as a solvent for most natural and synthetic resins.

In addition to diallylcyanamide, the dimethyl, diethyl, and diisopropyl cyanamides are also available in experimental quantities. It is felt that all these compounds may be of interest to the paint, paper, petroleum, plastics, rubber and textile industries. A technical bulletin describing the chemical and physical properties of these compounds is available on request. New Product Development Dept., American Cyanamid Company, 30 Rockefeller Plaza, New York 20, New York. PVP—December.

### NON-CORROSIVE STEEL

#### For Laboratory

"Durimet" is a low-carbon stainless steel which is said to be corrosion-resisting and is recommended for service in laboratory fume ducts, hoods, table tops and other equipment. It can be fabricated by crimping, welding or riveting in much the same manner as 18-8 stainless steel. Sheet sizes are 36 x 96" or 48 x 120". Duriron Co., Inc., Dayton 1, Ohio. PVP—December.

### MALEIC ESTERS

#### For Polymerization

Monomeric forms of maleic esters can be used to make resins with widely varying characteristics. By adjusting reaction conditions and choosing proper monomer, polymers can be produced which range from very brittle resins to soft materials. These esters are: diethyl maleate, dibutyl maleate and di (2-ethylhexyl) maleate. Lower molecular weight esters yield brittle polymers, while esters of high molecular weight produce soft, flexible polymers. Carbide and Carbon Chemicals Corp., Unit of Union Carbide and Carbon Corp., 30 E. 42nd Street, New York 17, N. Y. PVP—December.

### POLYESTER PLASTICIZER

#### Wide Compatibility

A new polyester plasticizer said to combine many desirable properties of both the monomeric and polymeric types has been put into full plant-scale production. Designated Paraplex G-60, the new product is characterized by low viscosity, high plasticizing efficiency, good behavior at low temperatures, light color, broad compatibility and low cost.

As a plasticizer in polyvinyl chloride compounds, the new G-60 is said to bring low-temperature flexibility to polyvinyl sheet and film stocks. In part because of its low viscosity, it has demonstrated its usefulness in the preparation of vinyl dispersion compounds such as organ-

osols and plastisols. Also, it has been found to exert a unique and useful stabilizing action on PVC type resins, producing compounds which appear to offer significant advantages by eliminating such objectionable characteristics as staining, opacifying, and spewing, often associated with the use of conventional stabilizers.

Another major use is as a combination plasticizer-stabilizer of chlorinated compounds. For instance, low concentrations of Paraplex G-60 have been found to improve the film length, adhesion and heat stability, and to increase the film toughness of coating compounds such as chlorinated rubber. Resinous Products Div. of Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa. PVP—December.



## 5 YEARS WITHOUT A BAD BATCH

**Sun Spirits Gives Paint Maker Fixed, Uniform Drying Time;  
Stabilizes the Dried-Surface Quality; Ends All Discoloration**

A Midwestern paint and varnish company wanted to find a reliable solvent. None used provided uniform drying qualities.

Then they tried Sun Spirits. This "Job Proved" solvent gave each of their many products a consistent drying characteristic. It enabled the maker to figure average drying periods and include this in the label directions. In five years none of the production has had to be rejected. Not one batch of white paint has been lost due to discoloration—a remarkable record. Not only has

Sun Spirits stepped up operations in this plant, but it has enhanced the company's reputation with trade and consumer.

Sun Spirits has excellent solvent and wetting-out properties with most natural and synthetic resins. Volatility is held within close limits to assure reliable drying-time in finished products. Purity is constantly checked to maintain consistent quality. For complete information call your nearest Sun Office.

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## NEWS DIGEST



Abbott K. Hamilton

### Commercial Solvents Names V.P.

Mr. Abbott K. Hamilton has been appointed a vice president of Commercial Solvents Corporation, it was announced recently by Henry E. Perry, president, following a meeting of the board of directors. Mr. Hamilton became associated with Commercial Solvents in January, 1947 when the company purchased the assets of the Pennsylvania Alcohol and Chemical Corporation, of which he was vice president, general manager, and a director.

### Exchange Club Resumes Meetings

The Paint and Varnish Exchange Club, Inc., held a special meeting at the Taft Hotel, New York City on Nov. 22, 1949. Forty members and guests were present. The following officers were elected:

President, Benjamin Joachim; Vice-President, Jack Binswager; Secretary, Dana Johnson; Treasurer, Thomas Curran.

At this meeting the membership expressed its wishes that the club be continued in the same spirit as the past. The club was founded in 1938 as a nonprofit incorporated club and was adjourned for the duration of World War II. Often nicknamed the "Brooklyn Paint Club" because of its meetings at the Brooklyn Engineers Club, it made a record for itself for achievement and benefits for all those engaged in the metropolitan paint industry. The next meeting is scheduled for some time in February.

### Revised Federal Specification

A preliminary draft covering Proposed Revision of Federal Specification, TT-2-321, has been released by E. F. Hickson, chairman of the Technical Committee on Paint, Varnish Lacquer, and Related Materials.

TT-Z-321 covers specifications for Zinc oxide, Leaded, Dry and Paste-In-Oil. The main purpose in revising the present specification is to streamline it by referring to test methods in Federal Specification TT-P-1416, and to follow the new outline of form for Federal specifications. There are no changes in the technical requirements.

### New Orleans Color Appoints Mgr.

Roy T. Cucullu has been appointed production manager of the New Orleans Paint & Color Co., New Orleans, La. it was announced by David Bernhardt, Sr., president of the company. Mr. Cucullu has been serving in an advisory capacity and will now be in full charge of all production problems.

### A. I. C. To Honor Dr. Murphy

Dr. Walter J. Murphy, noted editor of the American Chemical Society Journals, has been chosen to receive the 1950 gold medal of the American Institute of Chemists, it was announced by Lawrence H. Flett, president of the Institute. Each year the medal is awarded to an individual who has contributed some noteworthy service to the science of chemistry or the profession of chemist in America. Dr. Murphy was cited as "a great editor who has focused the world's attention on chemists and their contributions as professional men."

### Stanley of Socony Paint Dies

William M. Stanley, 56, vice-president and director of Socony Paint Products Division of Socony-Vacuum Oil Company, Inc., and assistant general sales manager of the division until his retirement in December 1948, died of a heart attack Nov. 18 while on a hunting trip in Texas. His home was in Hunt, Texas.

### PPG To Build Modern Plant

Pittsburgh Plate Glass Company expects shortly to begin construction of a paint plant at Torrance, California. An ultra-modern plant, the Torrance facility will cost approximately \$1,250,000, according to E. D. Griffin, vice president in charge of Pittsburgh's paint division. The plant should be ready to go into production within ten to twelve months.

Located about 15 miles from downtown, Los Angeles, the plant will be erected on a triangular, 15 acre site, fronting on Crenshaw Boulevard. Original equipment will permit production of 1,500,000 gallons annually. Sufficient floor area for additional equipment is available to boost the production to 2,600,000 gallons in the future.

Essentially a one-story, earthquake resistant structure, the building will have a second-floor center section designed for loading ball and pebble mills. Mixing of pigments for roller mills and screening of the raw materials into filling hoppers will be accomplished on the second floor.

All areas in which paint is thinned, tinted or processed will have northern light and all storage space will have southern exposure. Positioning of processing areas to the north will take advantage of the constant, visual qualities in the neutral, north light and will minimize entrance of solar heat into the manufacturing areas. In area, the plant will have 157,000 square feet of floor space, loading docks and covered walkways. An additional 93,000 square feet of roadways and parking lot area will be available.

A full line of Pittsburgh house, industrial and automobile paints will be produced at the Torrance plant. Model laboratory facilities will be installed and product development and control programs accelerated.

A lacquer producing plant will be moved intact from the firm's plant in Los Angeles. Planned also is the installation of a gas fired resin manufacturing unit. Sufficient resin production is anticipated to supply both the Torrance and the Portland, Oregon paint plants operated by the firm.

### Architect's Conception of New PPG California Plant





### Spray Painting Courses

Five intensive one-week courses for Industrial Finishers are included in the DeVilbiss School of Spray Painting curriculum for the first half of 1950. Maintained as a service to all users of DeVilbiss equipment, these tuition-free courses include comprehensive instruction on all spray painting techniques and the function and care of spray equipment.

Classes lasting one week each will begin on January 23, March 27, April 17, May 8, and June 19, with all courses covering the same subject matter. For further information and application blanks, write for Forms F-224 and INS-753-A. Since class size is necessarily limited, it is advisable to write for reservations as early as possible to The DeVilbiss Company, 300 Phillips Avenue, Toledo 1, Ohio.

### Research Fellowship

The Philadelphia Paint and Varnish Production Club has established a Fellowship at the Lehigh Institute of Research, Bethlehem, Pa.

The project involves the examination of non-Newtonian liquids, that is liquids which yield value and plasticity to determine whether the principles developed in the preceding studies with Newtonian liquids can be utilized in improving the mixing operations so widely used in the paint industry.

This project is under the direct supervision of Professor D. E. Mack. The end point of this study will be the design of the more speedy and the more efficient mixing equipment for use in the manufacturing of pastes, for thinning pastes, for tinting pastes and for blending varnishes.

### Second N. Y. U. Symposium

The second symposium of paint and varnish chemistry held on November 19th at the College of Engineering, New York University attracted some 150 guests and representatives of the paint and allied industries. The meeting was divided into two sessions. During the morning session, two papers were delivered.

Dr. James Hillier of the Research Laboratories of R. C. A., Princeton, N. J. gave an interesting paper on the electron microscope in industrial research. He covered the construction and

operation of the electron microscope and pointed out its use in industry, particularly in pigment and resin research.

Dr. Max Kronstein then spoke on "The Gel State in the Formation of Organic Coatings". The paper discussed the gel state of polyol-fatty acid esters and of their modifications as being a state between the soluble-liquid-fusible initial form and the solid, only limited-swelling, incoherent form, as had been introduced by Dr. Kronstein at the 1948 symposium.

The gel state is characterized by its capacity to swell in contact with suitable liquids and to form coherent swelling products. These are mostly capable of elongation, but resinous forms are known also, such as the ferric chloride-tung oil reaction products.

The gel formation and the further progressed insolubilization into the solid form is not limited to drying oils. The speaker refers to interesting solidification products of olive oil and teased oil, which show in the infrared spectrum even a more rapid shifting as so-called semidrying oils show.

Using the electron microscope in these studies, clear, relatively slowly gelatinized Chinawood oil gel showed, even in a film of 2-3/100 micron thickness, similar shrinking formations as had been known of tung oil coatings. But where the insolubilization had progressed further, the shrinking is no longer observed and the solidification formations are becoming more evident. By careful operation, clear, solid tung oil has been prepared which shows under the electron microscope incoherent particles.

In his earlier work, the author has found methods of reliquifying gelled oils into a fluid and—in solvents—stably dispersable form. Diffraction X-ray spectra show the presence of the gel in the reliquified material.

The fact that the solidification of oils does not necessarily require the saturation of all double-bonds, allows their further oxidation afterwards, whereby

substances of greater solvent resistance are obtained. In the same way, the reliquified oil gels are capable of regular curing processes. Methods are shown for the demonstration of the progress of such curing procedures. In technical experimental applications, interesting characteristics were shown.

The afternoon session opened with a talk on "Service Analysis of Surface Preparation and Paint Application Economics" by A. J. Liebman of the Dravo Corp., Pittsburgh, Pa. Mr. Liebman is presently Chairman of the Committee on Surface Preparation, National Association of Corrosion Engineers.

G. S. Cook of the United States Engineers Research Laboratories of Fort Belvoir, Va. followed with his paper on "A Determination of Fire Retardant Properties of Paints".

The session concluded with a talk on "Emulsion Paints" by Dr. Henry F. Payne, American Cyanamid Co. Dr. Payne is also secretary of the American Chemical Society, Div. of Paint, Varnish and Plastic Chemistry.

Following this session, the guests witnessed laboratory demonstrations of new test methods for paint products. These included:

Electrographic Printing Method (New York University Paint Project. Dr. Kronstein and co-workers).

The Adherometer. Interchemical Corp., Research Div. Dr. Clifford J. Rolle and Sydney Krakauer.

Testing Chemical Pretreatments on Metal (New York University Paint Project. Dr. Kronstein and co-workers).

Electrical Measurements in the Metal Protective Paint Research. National Lead Co., Research Laboratories. Mr. D. L. Hawke.

All arrangements and planning for this symposium was made by Dr. Max Kronstein in conjunction with the New York Paint and Varnish Production Club and the New York Paint and Varnish Lacquer Association.



Speakers at N. Y. U. Symposium. Left-to-Right: Prof. J. Happel, A. J. Liebman, Ass't. Dean H. J. Masson, Dr. Max Kronstein, G. S. Cook, Dr. H. K. Work, Dr. H. F. Payne, and Dr. J. Hillier.



### Metal Powder Show

The Metal Powder Association, sponsors of the Annual Metal Powder Show announce that the 1950 Show will be held in Detroit next April 25-26 at the Book-Cadillac Hotel. The Metal Powder Show is an exhibit of the latest products and developments of producers of metal powders, fabricators of parts made from metal powder, and manufacturers of equipment used in powder metallurgy. Held for the last two years in Chicago, next year's Show will be conducted on a larger scale with more and bigger exhibits in recognition of the growth of powder metallurgy coupled with the fact that Detroit, not only the heart of the automobile industry, also represents a large segment of the powder metallurgy industry. This will mark the sixth consecutive meeting and exhibit devoted exclusively to this industry. Exhibit space applications already received indicate that a broad cross-section of the industry will be represented and that several new and interesting products of this new industrial process will be on display. Further details about the Metal Powder Show may be obtained from the Metal Powder Association, 420 Lexington Avenue, New York 17, New York.

### Armour Plant

A new plant which will provide chemicals for industrial uses, was opened in Chicago recently by Armour and Company.

The new plant is intended to process up to 100,000,000 pounds a year of fats and oils, extracting their glycerine and converting their acids into amides, nitriles, amines and other products, for which dozens of uses have been devised by various industries, ranging from new detergents and water-proofing for concrete, to improved binder for asphalt roads and a step in enlarging the nation's supply of vital steel.

### American Can Promotes Baselt

F. C. Baselt, was promoted to assistant director of research of the American Can Company. He was first employed by this firm in 1925 and in 1942 was promoted to divisional manager of research in New York.

Mr. Baselt will remain in New York, but will correlate his work with that of the director of research at the company's general laboratories in Maywood, Ill.

Our November issue contained an

article on "Method of Testing Viscosity by the Ford Cup", without a by-line. This article was presented by the Chicago Paint and Varnish Production Club at the 27th Federation Convention, and is published with permission of the Federation of Paint and Varnish Production Clubs. We regret this error.

### Paint Course at St. Joseph's, Phila.

The Philadelphia Paint, Varnish and Lacquer Association and the Philadelphia Paint and Varnish Production Club, through their joint Educational Committee have established a course in paint technology at St. Joseph's College, Philadelphia. The curriculum was developed in joint meetings with the educational committee authorities of Saint Joseph's College and Dr. William T. Pearce as professor. The enrollment

for this course is 88 students, 59 from various paint and varnish companies, 16 from related industries and 13 senior students of chemistry at St. Joseph's College.

### New Resin Plant

Chemical Plants Division of Blaw-Knox Company has received a contract from Catalin Corporation of America for the design and construction of a liquid resin plant to be located at Calumet City, Illinois.

The plant will produce liquid phenolic, urea and melamine resins for use in waterproof adhesives and binders. The award to Blaw-Knox covers the erection of structures and equipment, including a laboratory and low temperature storage facilities. The plant will have facilities for tank truck, as well as rail shipments.

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# TECHNICAL

Bulletins

## RESIN GUIDE

Designed to aid the formulator in selecting the proper resin for his needs, this compact guide is devoted exclusively to tabulating the physical and chemical properties of each of the coating resins manufactured by the company. These resins include Rezyl alkyd resins, Melmac melamine resins, Beetle urea resins, Cycol copolymer resins, Phenac phenol resins, and Teglac dibasic-acid modified resins. Copies may be obtained without charge from American Cyanamide Company, Coating Resins Dept., 30 Rockefeller Plaza, New York 20, New York.

## DETERGENT ABSTRACTS

Bulletin No. 8, National Southern Products Corp., 630 Fifth Ave., New York 20, N. Y., presents a bibliography with abstracts on the uses of tall oil in the soap detergent sulfonating, emulsifying and related industries. The brief abstracts will provide a resume of the articles while conserving time of the research departments. If more specific information is desired, the original reference may be consulted.

## CARE OF PUMPS

Pump construction and maintenance is discussed in this 16-page bulletin, "Handbook for Care of Centrifugal Pumps," issued by the Allis-Chalmers Mfg. Co., 1114 S. 70th St., Milwaukee, Wis. Sketches are used to illustrate important points. Tabulation of pump troubles, their causes and remedies, provides a quick and easy diagnosis of the problem. Suggestions for scheduling a maintenance program are also included.

## HEAT TRANSFER EQUIPMENT

Kettler heat exchangers, condensers and coolers used in chemical processes are fully described by photographs and drawings in this 4 page folder, issued by the Patterson-Kelley Co., Inc., East Stroudsburg, Pa.

## COATING RESINS

A new properties chart for the protective coating resins produced by Durez Plastics & Chemicals, Inc., North Tonawanda, New York, is now available to the paint and varnish industries. The chart lists the physical properties, viscosities in oil and toluol, solubilities in solvents, compatibilities with wax and ethyl cellulose, and the suggested end uses for the resins. It is available in two sizes. One is designed for the laboratory wall and is 20 by 31 inches, printed in two colors. The other is 8½ by 11 inches, printed in one color, and suitable for ring binders and file folders.

Also announced by Durez are newly compiled data sheets on Durez 220 and 220-V protective coating resins. Comprising 10 and 8 pages respectively, the folders contain information on the properties of the resins, their compatibility with drying oils and other materials, as well as suggestions on cooking methods to be employed with various hard and soft oils.

## DIVINYLBENZENE

The Dow Chemical Company, Midland, Michigan, has released a technical data bulletin on divinylbenzene. The product is a monomeric mixture of the three isomers of divinylbenzene and ethylvinylbenzene, stabilized with an inhibitor. The proportions of these isomers are not known exactly, but the meta varieties predominate. Divinylbenzene can be polymerized with itself or copolymerized with other monomers such as styrene on application of heat and/or catalyst to produce a cross-linked or three dimensional polymer having excellent resistance to solvents and temperature. Suggested applications for the divinylbenzene monomeric mixture and procedures for polymerization and copolymerization are described in the bulletin.

## FLOW RATE INSTRUMENTS

The Fischer & Porter Co., of Hattboro, Pa. has issued a 24-page catalog describing a wide variety of remote, flow-rate indicating and controlling instruments. Installations are included and schematic diagrams are presented showing various applications.

## GLYCOL BOOKLET

Entitled "Dowanols," this booklet describes the use and properties of Dowanols, which are monethers of glycols. Four types are included: Dowanol 33B, 50B, 62B, and 93B-2. Of particular interest to the coating industry, this booklet contains information on the use of these glycols as solvents for nitrocellulose and synthetic resins, and discusses how evaporation rates varying from intermediate to very slow can be obtained by proper selections or blending of Dowanols.

Numerous tables and charts showing the various physical properties encountered with glycols are presented. Your copy may be obtained from the Dow Chemical Co., Midland, Mich.

## EMULSION PAINTS

In this brochure, an attempt has been made to present the basic principles of emulsification of protective coatings. Data and formula suggestions are presented as an aid in achieving basic conception of the problems embodied in emulsification. After a brief review of basic, theoretical considerations, formulation techniques are discussed, and finally some examination on the preparation of floor polishes. The brochure is entitled "The Preparation of Emulsion Paint and Polishes," and may be obtained from the American Gum Importers Laboratories, Inc., 360 Furman St., Brooklyn 2, N. Y.

## POLYVINYL CHLORIDE

Some 22 plasticized polyvinyl chloride formulations are offered in Technical Bulletin O-D-113, published by the Development Dept., Organic Chemicals Div., Monsanto Chemical Co., St. Louis, Mo. Plasticizers are added to the polyvinyl chloride resins to permit ease of processing and generally to impart flexibility and improve heat and light stability. These formulations are used in the manufacture of such articles as wire and cable insulation, shower curtains, raincoats, floor tile, etc. Because of the variety of desirable properties these plasticizers impart to polyvinyl chloride, best results, from a physical property and economic standpoint, are often obtained by using various plasticizer blends. These are discussed in this bulletin.

## LATEX FORMULATIONS

Formulations of emulsion paints employing aqueous dispersions of Chemigum Latex 101 are now offered by the Goodyear Tire and Rubber Co., Inc., Akron 16, Ohio. Formulae for producing flat wall and semi-gloss wall finishes are provided with procedures for mixing ingredients. Properties of these Latex paints are also given with particular emphasis on washability and abrasion tests. The suggested formulae are regarded only as starting points for individual evaluations, since work now in progress gives promise of further improvement. When writing for this information specify, Techni-Guide # C-102.

## CASTOR OIL FORMULATIONS

This technical digest describes and discusses a group of selected protective coating formulations based on Baker's Castung (dehydrated castor oil) and Castor Oils.

These formulations have been chosen with the primary purpose of emphasizing the broad application of dehydrated castor and castor oils in protective coatings. Discussion of twelve diverse uses to which these oils are applicable are submitted in this

digest for your study and evaluation.

Both conventional and new applications are considered. This type of application is featured in this digest by a series of spar varnishes and aluminum paint vehicles. On the other hand, the use of Castung as a white house paint vehicle is a more recent development. To illustrate the utility of Castung in this field, three white house paint formulations are given as practical starting points for the manufacture of this type of exterior coating.

## BANBURY MIXERS

Bulletin 180 published by Farrel-Birmingham Co., Inc. of Ansonia, Conn. describes the use of Banbury mixers in the rubber, plastics, paint, linoleum, and asphalt industries. Mixing of pigments with nitrocellulose, synthetic resins, oils, may be done by the Banbury mixer in a matter of minutes, according to the manufacturer.

Design and construction of these mixers are illustrated in the bulletin. Size and capacities are covered and recommendation for installation are included. Also listed are the names of various firms and industries now using these types of mixers.

## MBDSA BULLETINS

The Chemical Division of Koppers Company, Inc., has announced publication of a technical bulletin describing the physical and chemical properties of, and recommending uses for, meta-Benzenedisulfonic acid (MBDSA), an intermediate compound, which now is being produced in pilot plant quantities by Koppers. A dibasic sulfonic acid produced in grey to white crystals, MBDSA undergoes reactions typical of benzene sulfonic acid and can be nitrated, sulfonated, or converted to acid chlorides. The odorless acid is extremely hygroscopic and is soluble in water, ethanol, and acetone.

MBDSA has been suggested for use as an additive in the electroplating of certain metals, as an intermediate for dyestuffs, pharmaceuticals, and photographic chemicals, and as a catalyst for esterifications and for curing of condensation type resins. The seven-page technical bulletin, which also describes proper methods of storage and handling and contains a list of technical references, may be obtained by requesting Bulletin C-9-53 from Koppers Company, Inc., Chemical Division, Pittsburgh 19, Pa.

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